

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(c), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(c) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/08/2009 has been entered. Claims 1, 10 and 11 were amended.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on 12/23/08.

Claim Rejections - 35 USC § 102

3. The claim rejections under 35 U.S.C. 102(e) as being anticipated by Noetzel et al. (US Publication No. 2003/0235730) on independent claims 1, 10 and 11 are withdrawn because all three claims have been amended.

Claim Rejections - 35 USC § 103

4. The claim rejections under 35 U.S.C. 103(a) as being unpatentable over Noetzel et al. (US Publication No. 2003/0235730), Ito (Japanese Patent 2002-134150A), Matoba (U.S. Patent Application Publication 2004/0005487) and Beutel et al. (U.S. Patent Application 2002/0134239

A1) on claims 6-9 are withdrawn as the independent claim 1 from which they depend has been amended.

5. Claims 1, 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noetzel et al. (US Publication No. 2003/0235730) and further in view of Fujita et al. (US Patent Application 2002/0192519 A1) and Keskula et al. (US Patent Application 2002/0051899 A1).

Regarding claim 1, Noetzel teaches a control device (power conditioner 14) of a vehicular fuel cell system illustrated in Figures 1 and 2 comprising: a warm-up output control section operative (power switching device 42) that allows a fuel cell system stack (18) of a fuel cell system (10) to be warmed up under a low temperature condition causing the fuel cell stack to generate electric power to allow predetermined warm-up electric power to be taken out ("In a current blocking mode [such as start-up], ...the power switching device 42 disallows substantially all current flow from the fuel cell unit 12, thereby enabling fuel cell unit 12 to operate in a substantially unloaded condition" (paragraph 22)); and a run permission section operative (power switching device 42) that discriminates whether the fuel cell stack assumes a predetermined warm-up condition on the basis of either a voltage value or an electric current value of the fuel cell stack and providing run permission to a vehicle if it assumes the predetermined warm-up condition ("A power conditioner electrically connected to the fuel cell unit includes a power switching device. The power switching device selectively connects and disconnects the fuel cell voltage to at least one load dependent at least in part upon an operating temperature of the fuel cell stack, the fuel cell voltage, and the fuel cell current to thereby produce an output voltage" (paragraph 10)).

It would have been obvious to one of ordinary skill in the art to take the power conditioner of Noetzel and break it down into two entities (namely, the warm-up output control section operative and a run permission section operative), as the two entities can perform the same functions together or separately. The Courts have held that making known elements separable is within the skill of a person of ordinary skill in the art. See *In re Dulberg*, 129 USPQ 348 (CCPA 1961) (see MPEP § 2144.04).

Furthermore regarding claim 1, Noetzel teaches a control device (power conditioner 14) where the run permission section (power switching device 42) provides the vehicle with run permission when the voltage value of the fuel cell stack is equal to or more than a predetermined value: "The power switching device selectively connects and disconnects the fuel cell voltage to at least one load dependent at least in part.... by the fuel cell voltage" (paragraph 10). In the alternative, Noetzel teaches a control device (power conditioner 14) where the run permission section (power switching device 42) provides the vehicle with run permission when the electric current value of the fuel cell stack is equal to or more than a predetermined value: "The power switching device selectively connects and disconnects the fuel cell voltage to at least one load dependent at least in part.... by the fuel cell current" (paragraph 10).

Furthermore, Noetzel teaches a control device (power conditioner 14) that determines the predetermined value in dependence upon an electric current value or a voltage value appearing when the fuel cell stack generates electric power:

"The mode controller... (which is part of the power conditioner 14) determines the mode in which power conditioner 14 and fuel cell unit 12 operate in order to maintain efficient operation... Mode controller 28 issues converter mode signal 54 which is indicative of the operational mode that is most efficient given the operating conditions and parameters of fuel cell unit 12 and power conditioner 14. Mode controller 28 issues to fuel cell controller 16 a cell operational control signal 70, which is indicative of any adjustments necessary to the output,

such as, for example I_{STACK} and V_{STACK} " (where I_{STACK} is the current of the fuel cell stack and V_{STACK} is the voltage of the fuel cell stack) (paragraph 26).

Claim 1 has been further amended to recite that either the predetermined voltage value is based upon the electric value of the fuel cell stack or the predetermined current value is based upon the voltage value of the fuel cell stack. The specification provides an explanation as to what this claim language means:

"...the run permission section retrieves run available voltage, in terms of detected stack current, referring to the current/voltage characteristics in Figure 6 [which is] representative of the relationship between stack current and stack voltage... at which the vehicle is available to travel. The current/voltage characteristics shown in Figure 6 [are] stored as a map in a memory..."

Noetzel does not teach how the predetermined voltage or current value is found and only states that these predetermined voltage and current values are used to determine whether or not a vehicle is provided with a run permission. Fujita discloses that voltage-current characteristic maps are known in the art and that an output voltage can be determined from the electric current (paragraphs 173 and 174). Additionally, Keskula discloses that a fuel cell stack can be characterized by a voltage at a given current or conversely, as a current at a given voltage. These are called polarization curves and a family of these can be made for a given set of operating conditions as the relationship between voltage and current can vary according to the operating conditions (paragraphs 27-29).

It would have been obvious to a person of ordinary skill in the art to apply the known technique of applying a voltage-current characteristic map to a fuel cell in order to obtain a predetermined voltage from the current value of the cell or vice versa as taught by Fujita or Keskula to the control device of Noetzel in order to determine the predetermined voltage value or predetermined current value. Applying a known technique to a known device ready for

improvement to yield predictable results is likely to be obvious. See *KSR International Co. v. Teleflex Inc.*, 550 U.S., 82 USPQ2d 1385, 1395 – 97 (2007) (see MPEP § 2143, D.). The predictable results in this case would be the determination of the predetermined voltage or current value based on a set of operating conditions (i.e.- warm-up conditions).

Regarding claim 10, Noetzel teaches a control device (power conditioner 14) of a vehicular fuel cell system illustrated in Figures 1 and 2 comprising a warm-up output controlling means and a run permission provided means both embodied in a power switching device (42) as demonstrated in the arguments above for claim 1. As claim 10 does not provide any new means not already written in claim 1, see the above arguments.

The Applicant's specification supports the "means... for controlling the fuel cell stack" and the "means... for providing a vehicle with run permission" as recited in claim 10 (see Applicant's specification, page 5, lines 15-30). Accordingly, this means-plus-function language invokes a 35 U.S.C. 112, sixth paragraph limitation (see MPEP 2181). The means "for controlling the fuel cell stack" and the means for "providing a vehicle with run permission" are interpreted to be a control device comprised of a warm-up output control section operative and a run permission section that make determinations on the temperature of the fuel cell on the basis of current and voltage values of the fuel cell.

Regarding claim 11, Noetzel teaches a method of controlling a fuel cell system comprising taking out predetermined warm-up electric power by controlling the fuel cell stack to generate electric power under a low temperature condition and in the case that the fuel cell system is warmed up, providing a vehicle with run permission based on the voltage and electric current values of the fuel cell stack:

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"Once a fuel cell unit 12 reaches its operating or use temperature, fuel cell unit 12 exits the start-up mode and enters the operating mode. The readiness of fuel cell unit 12 to enter the operating mode is detected by mode controller 28, through monitoring of I_{STACK} and V_{STACK} , which alters mode signal 54 accordingly" (paragraph 32). Also, see claims 13-16 of Noetzel.

Claim 11 was further amended to add the claim limitations of claim 1. The rejection of these claim limitations can be found in the rejection of claim 1.

6. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Noetzel in view of Fujita and Keskula as applied to claim 1 above, and further in view of Ito (Japanese Patent 2002-134150A).

Regarding claim 6, Noetzel teaches the run permission section (power switching device 42) providing the vehicle with run permission when the temperature of the fuel cell stack is equal to or more than a predetermined value (paragraph 10); however, Noetzel does not teach that the vehicle is provided with run permission based specifically on the temperature of the coolant in the fuel cell stack. Ito provides a similar system to Noetzel and does teach the temperature of the coolant in the fuel cell stack providing information so that the vehicle is provided with run permission: "the above standby detection means detects standby of the above-mentioned fuel cell by the above-mentioned cooling method... based on the temperature of the above-mentioned cooling water [that flows through the fuel cell stack]" (paragraphs 1-9).

This is an example of combining prior art elements according to known methods to yield predictable results (MPEP 2143). It would have been obvious to one of ordinary skill in the art to have adapted the detection means determined by temperature of coolant taught by Ito to the control device of Noetzel to provide another means to determine whether the vehicle is provided with run permission.

7. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Noetzel in view of Fujita and Keskula as applied to claim 1 above, and further in view of Matoba (U.S. Patent Application Publication 2004/0005487).

Regarding claim 7, Noetzel teaches the overall fuel cell system including a run permission section, but fails to teach that when the temperature of coolant in the fuel cell stack is less than a predetermined value, an auxiliary device is provided to a power plant including the fuel cell stack in order to heat the fuel cell stack. Matoba does teach this:

"The combustor 9 produces combustion gas using the effluent supplied from the fuel cell 17. The produced combustion gas is supplied to a heat exchanger 10 and used as a heat source... to heat coolant used in the cooling system of the fuel cell 17" (paragraph 25).

Therefore, Matoba teaches an auxiliary device (combustor 9) to provide power to a fuel cell. It would have been obvious to one of ordinary skill in the art to use the combustor of Matoba in the system of Noetzel in order to provide heat to the fuel cell stack so that it can get to optimal operating conditions more quickly. This is an example of combining prior art elements according to known methods to yield predictable results (see MPEP 2143).

Regarding claim 8, Matoba teaches that the auxiliary device (combustor 9) includes a combustor to which exhaust emitted from the fuel cell stack is introduced; in this case, the combustor is one in the same with the auxiliary device. As the combustor of Matoba performs all the same functions as the auxiliary device and combustor of this patent application, it is not necessary to have a separate entity entitled "auxiliary device." The Courts have held that making known elements separable is within the skill of a person of ordinary skill in the art. See *In re Dulberg*, 129 USPQ 348 (CCPA 1961) (see MPEP § 2144.04).

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Noetzel in view of Fujita, Keskula and Matoba as applied to claims 7 and 8 above, and further in view of Beutel et al. (U.S. Patent Application 2002/0134239 A1) (hereinafter "Beutel").

Regarding claim 9, Matoba teaches a combustor section (9) combusting the exhaust and a heat exchanger (10) allowing combustion heat of the exhaust to be transferred to the coolant as is illustrated in Figure 1 above (paragraphs 25-29), but fails to teach the rest of the claim. Beutel teaches the rest of the claim and discloses that it is well known in the art to provide a combustor with an electric-heated catalyst section operative that is heated to a catalytic active temperature by electric heat and that the catalytic combustor section combusts the exhaust (paragraph 6).

This is an example of combining prior art elements according to known methods to yield predictable results (see MPEP 2143). It would have been obvious to one of ordinary skill in the art to combine the combustor with an electric-heated catalyst section operative of Beutel to the combustor of Matoba in order to make sure the effluent contains no hydrocarbons and is completely combusted.

Response to Arguments

9. Applicant's arguments, see pages 5-8, filed 10/08/09, with respect to the rejections of claims 1, 10 and 11 under Noetzel et al. have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Noetzel, Fujita and Keskula.

11. Applicant requested that the interpretation of the “means” language of claim 11 provided on pages 6 and 7 of the previous Office Action be rendered moot in light of the amendments to the claims. The Examiner respectfully submits that this is a mistake and that the Applicant meant to request the interpretation of the “means” language for claim 10 as there is no means language present in claim 11.

The amendment does not render the “means” language moot as claim 10 still recites, “a means... for controlling the fuel cell stack” and the “means... for providing a vehicle with run permission,” and does not recite the specific structure/entity of the “means.” The interpretation is therefore not rendered moot.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMANDA BARROW whose telephone number is (571)270-7867. The examiner can normally be reached on 7:30am-5pm EST. Monday-Friday, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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